WHAT'S CULTURE GOT TO DO WITH IT? GUIDELINES FOR DEVELOPING A SAFETY CULTURE IN HIGH-CONSEQUENCE INDUSTRIES

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It has been suggested that human error is a major factor leading to unsafe practices and ultimately accidents in high-consequence industries (e.g., aviation, medical). To further explore this area, we reviewed the safety literature to determine what factors contribute to unsafe practices in these industries. An overwhelming number of studies suggest that a poor organizational safety culture is a significant contributor to errors and accidents. We also found that there was a lack of consistency between what the literature suggests and actual organizational practices. As the environments that these organizations operate in are becoming more complex and dynamic (e.g., new technology, increasing diversity), the need to develop a culture that encourages safe practices is great. Therefore, we developed literature-based guidelines to assist in the development of a safety culture that encourages safe practices from a macro-level perspective (i.e., from the individual worker to upper level management to the overall organization). It is our hope that the information provided will help organizations to improve safety within their organization as they operate in high-consequence environments.

Introduction

The flight crew of XYZ Airlines is waiting to take off at a snow-delayed airport. The plane has been deiced and is second in line to takeoff. However, it has been more than 30 minutes since its last deicing. The snow continues to fall and is slowly accumulating on the wings of the aircraft. In order for the crew to not violate their mandatory crew rest period, the flight must takeoff within the next few minutes. Additionally, it is Christmas Eve and the flight is full with passengers. Knowing that returning to deice the plane again would likely result in the crew exceeding their maximum flight hours and the flight having to be cancelled, the crew decides to risk the takeoff despite the snow accumulation. After all, there isn't that much snow on the wings. Or is there? As the plane rolls down the runway and reaches the takeoff speed, the captain pulls back on the flight controls. The plane slowly takes off however the aircraft is not climbing as usual due to the snow accumulation. The aircraft narrowly misses the treetops ahead before finally reaching a safe altitude.

It is simple in the example provided to blame the crew for their poor decision to take off under the dangerous conditions. However, more importantly (and less obvious to most) is the role that the organization may have played in their poor decision making. Had the crew chosen to abort the takeoff leading to the cancellation of the flight, they likely would have been reprimanded for the revenues lost and inconveniences caused to the organization and the passengers. How many times have other flight crews been faced with a similar decision? One in which the safety of the flight will be jeopardized versus risking being reprimanded. Probably more often than we would like to know.

While it has been suggested that human error is a major factor leading to unsafe practices and ultimately accidents in high-consequence industries (e.g., aviation, medical; e.g., Decker, 2001), the role of the organization's safety culture (or lack thereof) may be equally to blame. Thus, the need to develop a positive safety culture in high-consequence environments is crucial to an organization's success. We turned to the safety literature to determine what are the key factors that should be considered when developing a safety culture in organizations. Based on what we found, we developed literature-based guidelines to help organizations improve safety from a macro-level perspective, namely through the development of a safety culture. We discuss those next.

A review of the literature

As a part of this effort, we first turned to the literature to determine what was available regarding culture, specifically safety culture. While safety has been a concern in organizations for some time (see Pidgeon, 2001), the notion of a safety culture did not became "popularized" until the Chernobyl tragedy in 1986. Cited as a contributing factor to this nuclear disaster was the organization's poor safety culture (e.g., Mearns & Flin, 1999; Glendon & Stanton, 2000).

There are a number of definitions provided in the literature as to what a safety culture is (see Wilson-Donnelly, Priest, Salas, & Burke, in press for a review). In general, however, a safety culture can be defined in terms of: (1) what the organization *has*, or aspects of the organization that relate to safety (e.g., norms, policies) and (2) what the organization *is*; its common values, beliefs, attitudes, and behaviors regarding the safety of individuals and groups, establishing the organization's commitment to, style of and proficiency of its safety program (Glendon & Stanton; Pidgeon, 1991; Reason, 1998). In short, a safety culture determines what behaviors will be observed in the work environment and thus how safe an organization will be.

But what are organizations really doing to address the issue of safety? Our review found that many organizations (e.g., manufacturing; Jordan & Michel, 2001) have turned to micro-level strategies to manage errors and improve safety within the organization. For example, teams and the training of teams (e.g., resource management training; Salas, Bowers, & Edens, 2001) are being increasingly used to improve safety. The premise behind this is that the human operator is typically the last person involved with the system prior to an accident. Therefore, it is often easiest and most common to want to fix the problem at this micro-level (e.g., through training). While training of employees (teams or individuals) is a welcomed start in the right direction, organizations seem to be ignoring the larger picture. Organizations, therefore, must look beyond the micro-levels (e.g., providing minimal training to workers) to more macro-level strategies for improving safety (i.e., safety culture).

So if a positive safety culture is necessary for improving the safety of the organization, how do organizations develop a safety culture? To determine this, we explored the literature further to determine what macro- and micro-level factors should be considered when developing a safety culture in high-consequence organizations. What we found was relatively little in terms of a synthesis which offered a complete picture of these macro- and micro-level factors.

While, admittedly, there will always be the risk of human error (remember "to err is human"), it is just as likely that other levels of the organization will err as well. Developing a positive safety culture that extends to all levels of the organization may be more effective than merely addressing the micro-levels. While the micro-level strategies are vital to the safety of an organization, improving safety must involve the whole organization. Therefore, these micro-levels strategies should be incorporated into the macro-level strategies such as an overarching safety culture.

We will next present guidelines for developing a safety culture in organizations from a macro- and micro-level perspective.

Guidelines for developing a safety culture in organizations

The guidelines presented in this paper are offered as a way to encourage organizations to approach safety from a macro-level perspective that involves individuals at all levels of the organization, not just the employees. It is important to note, however, that we are not attempting to oversimplify the complexities inherent to the development of a safety culture. We do not claim that it is easy. We do hope that the guidelines we present here will provide organizations with a starting point from which to build on. We suggest that organizations take great care when implementing these guidelines into current practices and examine their meaning at a deeper level. Additionally, while some of the information presented next may seem like "old news", through the literature and our experience we have found a gap between research findings and their implementation (i.e., research findings are not being implemented into real world organizations). Because we believe they are of great importance to the safety of organizations, we will (again) present the guidelines along with findings in the literature to support them (see Table 1).

GUIDELINE 1. Send appropriate signals that safety matters…clearly and precisely communicate them. As the saying goes, "actions speak louder than words." Therefore, it may not be enough for organizations to just *say* that safety matters. Rather the written safety policies and procedures of the organization provide employees with an understanding of what is expected of them in terms of safe attitudes and behaviors and guidance on how to meet those expectations (Degani & Wiener, 1997). Research by Diaz and Cabrera (1997) suggests that written safety policies likely influence workers behaviors, their perceptions, and overall safety climate. In order to ensure that the safety policies and procedures are adhered to, we encourage organizations to do two things. First, involving employees in the process of developing the policies and procedures (e.g., participatory ergonomics) will help motivate adherence. Employee involvement will give them a feeling of knowledge and power, thereby increasing their acceptance of the new policies and procedures (e.g., Wilson & Haines, 1997). Second, putting the safety policies and procedures in writing will help the organization to avoid normalization of deviance (i.e., avoid unsafe practices becoming the norm) and will minimize any misinterpretation of expectations that could lead to the occurrence of unsafe behaviors (Vaughan, 1996).

GUIDELINE 2. *Make people believe in and support safety…start at the top.* It has been suggested that important to an effective safety culture is support from upper level management. Furthermore, the practices of management (e.g., support of safety policies and procedures, wages based on occupational safety) are said to influence employees' safety attitudes which in turn impact the occurrence of safe behaviors. A commitment to safety from management will also help to ensure that deviance does not become normalized (see Guideline 1). Therefore, it is important that organizations understand the influence of all levels on safety throughout the organization (Pidgeon, 1998; Barling & Zacharatos, 1999). Finally, feedback must be provided to employees by management that makes them aware of their safety performance. A lack of support from those said to be enforcing safety, will reduce the motivation of employees to adhere to the safety policies and procedures of the organization. Moreover, seeing is believing and the more employees see management's commitment to safety the more likely they will be to develop positive attitudes towards safety and perform safe behaviors.

GUIDELINE 3. Promote error checking…encourage continuous learning. The purpose of a continuous learning climate is to encourage employees to learn from their mistakes, not hide them and cover them up. However, in order to learn from mistakes, the errors that lead to them must be identified. To do this, employees should be encouraged to routinely check for errors so as to avoid, trap, or mitigate the consequences of them before a serious accident occurs (Helmreich, Merritt, & Wilhelm, 1999). Additionally, this continuous learning must be encouraged and supported by management regardless of the costs. For example, the implementation of a punitive climate that seeks to blame the employee for a mistake will discourage employees from reporting errors that are made (Hofmann & Stetzer, 1998). Therefore, those that occasionally err should not be blamed (Westrum, 1987, as cited in Pidgeon & O'Leary, 1994). Rather, the factors contributing to the occurrence of the error should be investigated (not just the outcome of the error) and when those factors are identified, the organization should learn techniques for minimizing their impact (Barling & Zacharatos, 1999).

GUIDELINE 4. Open communication is a must…encourage it. Important to the success of a learning climate (see Guideline 3) is having good information flow between upper management and employees. Employees should feel comfortable communicating their ideas and opinions regarding safety issues affecting their work. Additionally, upper level management should keep employees informed about changes to safety policies and procedures that will impact their work. Finally, employees and management should openly discuss mistakes that occur so that learning can occur regardless of cost.

GUIDELINE 5. Search for solutions…examine all levels and promote different methods. When an accident or incident occurs, many organizations tend to focus on the micro-level factors that influenced the event (i.e., investigating the role of the human operator). However, a host of literature is available suggesting that macro-level factors within the organization (e.g., safety culture) may be equally to blame and need to be further investigated (e.g., Karwowski, Warnecke, Hueser, & Salvendy, 1997). We realize that organizations may not be aware as to how to do this. Therefore, we would encourage them to utilize an existing approach available in the literature if one is not already in place within their organization. Two macro-level approaches for investigating accidents and incidents include the Haddon matrix (Haddon, 1980; Runyan, 1998) and the Human Factors Analysis and Classification System (HFACS; Wiegmann & Shappell, 2003). Both of these approaches have been adapted to various organizations, including those in operating in high-consequence environments.

GUIDELINE 6. Encourage documentation of errors…create an error reporting system. Important to improving the safety of an organization is to document the errors that are occurring within it. Because the rate of accidents within high-consequence environments are seldom, it is important that organizations encourage employees to document errors that do not result in an accident and would be otherwise undetected by management. To do this, organizations should develop a voluntary, non-punitive error reporting system to track these incidents without the fear of blame and retribution (Westrum, 1987, as cited in Pidgeon & O'Leary, 1994). If these errors go unreported, the organization cannot learn from them and thus they will continue to occur (Barling & Zacharatos, 1999). A punitive culture will discourage employees from coming forward when a mistake is made and could lead to more severe consequences in the future (Hofmann & Stetzer, 1996).

GUIDELINE 7. Prepare people through training… provide the competencies needed. Extensive research has been conducted in the area of training to improve safety and reduce errors in high-consequence industries for over two decades (e.g., Salas et al., 2001). Yet these training programs can fall short when organizations fail to put into practice the "science of training" (see Salas & Cannon-Bowers, 2001). In other words, safety training is not designed, developed, implemented, and evaluated systematically (see Salas & Cannon-Bowers, 2000). As a part of designing training systematically, the requisite competencies need to be identified and trained. These competencies should be based on what is learned from the accident investigations and be identified as those needed to correct deviant behaviors and encourage the safety culture desired by the organization (Harvey, Bolam, Gregory, & Erdos, 2001). The organizational safety culture must then encourage the transfer of the trained competencies to the task environment. Due to a lack of space, we encourage the reader to see Salas and Cannon-Bowers (2000, 2001) and Wilson-Donnelly et al. (in press) for a discussion of the eight primary factors that should be considered when developing a safety training program.

GUIDELINE 8. If you don't know it's broke, you can't fix it…measure/assess the effectiveness of training. Training to improve safety is an important part of a safety culture. However, equally important is the assessment of whether the training was effective. A well-utilized training evaluation typology suggests four levels at which training should be evaluated (Kirkpatrick, 1976). The four levels are: (1) reactions (i.e., did trainees like training), (2) learning (i.e., did trainees learn from the training), (3) behaviors (i.e., did trainees apply the trained skills on the job), and (4) organizational results (i.e., did training influence the safety of the organization over time). As it is the easiest to measure, many organizations only assess trainees' reactions to training. However, recently Salas et al. (2002) argued for the importance of not only assessing the higher levels of training but also

multiple levels of training. The reason for this is that they argue that positive reactions to training do not guarantee learning, and additionally, learning does not guarantee that trained behaviors will be applied on the job. Furthermore, it is important that the lasting of effects be assessed to ensure that the trained safe behaviors are being applied over time. By using methods of behavioral measurement, organizations can pinpoint problems and incorporate them into future training programs.

GUIDELINE 9. You get what you ask for…reward the right behaviors. A significant folly in organizations (including those in high-consequence industries) is that in an attempt to reward safe behaviors, the wrong behaviors (or those that the safety culture is trying to discourage) will actually be encouraged and supported (Kerr, 1995). Continuing with the example provided at the beginning, while the airline wants to discourage behaviors that jeopardize the flight's safety (e.g., takeoff with snow accumulation), the fact that the pilots will be reprimanded for the cancellation of a flight will actually encourage them to takeoff in the potentially hazardous situation. Therefore, failures of the safety culture may in fact be due to something that the organization least expects. As such, it is important that organizations are cognizant of their potential for encouraging unsafe behaviors, and should take corrective measures to ensure that the correct behaviors are rewarded.

GUIDELINE 10. Promote teamwork...effective coordination and communication is a must. Within high-consequence industries, teams are relied upon to accomplish the organizational goals (e.g., flight crews, surgical teams). The synchronized, collective action of team members requires a collection of processes, strategies, and actions that allow team members to effectively and efficiently perform interdependently. Teamwork is characterized by a set of flexible and adaptive behaviors (i.e., what team members do), cognitions (i.e., what team members think), and attitudes (i.e., what team members feel) (i.e., competencies; Salas & Cannon-Bowers, 2001). However, teamwork is not automatic and must be promoted and supported by management for it to be successful (Hackman, 1990). Therefore, organizations must encourage members to work together by coordinating and communicating at the team level.

Conclusion

The environments within which high-consequence industries operate is filled with complexity, even more so as innovative technologies are introduced. However, the severe consequences of errors in these industries drives home the need for an integrated, macro-level approach to safety. The purpose of this paper was to provide an understanding of factors that impact safety and to offer guidelines to help organizations develop a positive safety culture. For some time, researchers have been arguing that organizations should take a macro-level approach to improving safety (e.g., Imada & Nagamachi, 1990), however it implementation has been limited. Why might this be the case? Are we afraid of uncovering lapses within our organizations? Until we can embrace the notion that safety is an organization-wide phenomenon, organizations will struggle with achieving the highest safety standards. As the threat of error will always be a possibility, why not approach it proactively? Developing a positive safety culture is the way to do this. We encourage organizations operating in high-consequence environments to take on this challenge to critically evaluate themselves above that of the individual operator to ensure that its workforce maintains high safety ratings. So, what's culture got to do with it? Everything!

Endnotes

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Table 1. Guidelines and their explanations for developing a safety culture

Guidelines	Considerations
1. Send appropriate signals that safety matters…clearly and precisely communicate them.	▪ Get employees involved. ▪ Avoid normalization of deviance.
2. Make people believe in safety…start at the top.	▪ Get a commitment from upper level management. ▪ Provide feedback to employees.
3. Promote error checking… encourage continuous learning.	▪ Learn from employee mistakes. ▪ Routinely check for errors.
4. Open communication is a must…encourage it.	▪ Have good information flow between all levels. ▪ Make employees feel comfortable communicating ideas and opinions.
5. Search for solutions…examine all levels and promote different methods.	▪ Explore solutions from many different angles. ▪ Use an existing accident investigation technique (e.g., Haddon matrix).
6. Encourage documentation of errors…create an error reporting system.	▪ Create a non-punitive culture. ▪ Develop a voluntary, non-punitive error reporting system.
7. Prepare people through training…provide the competencies needed.	▪ Follow the science of training. ▪ Design, develop, implement and evaluate training systematically.
8. If you don't know it's broke, you can't fix it…measure/assess the effectiveness of training.	▪ Continuously examine ongoing behaviors. ▪ Take measures to correct unsafe behaviors.
9. You get what you ask for…reward the right behaviors.	▪ Encourage and support the right behaviors. ▪ Avoid rewarding the wrong behaviors.
10. Effective coordination and communication is a must…promote teamwork.	▪ Promote interdependencies among team members. ▪ Encourage members to coordinate and communicate at the team level.